

# **A RADIO FREQUENCY IDENTIFICATION SYSTEM FOR IDENTIFYING AND LOCATING GOLF BALLS IN DRIVING RANGES AND GOLF COURSES.**

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## **Background of the Invention**

### **1. Field of the Invention**

The present invention relates to a wireless and/or wired grid of transceivers in driving ranges and golf courses for locating golf balls with a wireless passive radio frequency identification system, and more particularly pertains to a new system for identifying and tracking multiple golf balls in large terrains.

### **2. Description of the Prior Art**

Known prior art Golf Ball Locating Devices include U.S. Pat. No. 5,447,314; U.S. Pat. No. 5,423,549; U.S. Pat. No. 5,298,904; U.S. Pat. No. 4,698,781; U.S. Pat. No. 4,528,566; U.S. Design Pat. No. 355,943 and U.S. Pat. No. 5,910,057.

While these devices fulfill their respective, particular objectives and requirements, the aforementioned patents do not disclose a new system for identifying and tracking multiple golf balls in large terrains using a wireless and/or wired grid of transceivers and wireless passive radio frequency identification system in golf balls. The inventive system includes uniquely identifying and tracking multiple golf balls for groups of golfers in wide terrains typically found in golf courses or driving ranges, and helps maintain golf scores for the golfers.

In these respects, the inventive system materially and conceptually departs from the conventional concepts and designs of the prior art.

## Summary of the Invention

In view of the forgoing disadvantages and limitations inherent in the known types of Golf Ball Locating Devices now present in the prior art, the present invention provides the capability for uniquely identifying and tracking multiple golf balls for individual golfers in a golf course or driving range, maintaining golf scores for each golfer, and finding the distance of a golf ball to the cup on the green and to the personal data assistant (PDA).

The general purpose of the present invention, which will be described subsequently in greater detail, is to substantially enrich the pleasure of golf by aiding the individual golfers in tracking their golf balls and maintaining golf scores. The management of golf courses would be improved by reducing time lost by patrons in locating golf balls and maintaining golf scores. Notice that the special merits of the present invention is the real time computer database of the location/map of golf balls and the location of golfers along with their golf scores. Individual golfers carry a hand held PDA which maintains wireless communication with the computer server and/or database management system.

The list below provides the objectives of the present invention:

1. To provide a new golf ball with a wireless passive RFID transponder which would locate the ball and simultaneously identify it with a serial number.
2. To provide a wireless and/or wired grid of transceivers to (a) transmit and receive electromagnetic signals to and from the golf ball, (b) to locate and read the serial number of the ball from the electromagnetic signals, (c) to receive and transmit electromagnetic signals from and to the hand held PDA of a golfer, (d) to locate and identify the location and identity of the hand held PDA, hence the identity of the golfer or the party of golfers, and (e) to transmit and receive all the electronic information in items 2a, 2b, 2c and 2d to a computer server and/or database management system.
3. To provide a computer server and/or database management system which maintains (a) a database of the location and identity of the golfers along with their golf scores and golf balls and (b) a database of maps of the golf course, map of the transceiver grids and contour maps of the greens.

### Brief Description of the Drawings

The invention will be better understood and objects other than those set forth above will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

Figure 1 is a schematic drawing of a passive radio frequency identification (RFID) transponder which is embedded in a regular golf ball.

Figure 2 is a schematic drawing of the electromagnetic coupling (backscatter) of the transceiver and the passive RFID transponder.

Figure 3 is a schematic drawing of the wireless and/or wired grid of transceivers.

Figure 4 is a schematic drawing of the personal data assistant (PDA).

### Description of the Preferred Embodiments

With reference now to the drawings, and in particular to Figures 1 through 4 thereof, a new radio frequency identification (RFID) system identifying and locating golf balls in driving ranges and golf courses embodying the principles and concepts of the present invention and generally designated by the reference numeral **1** will be described.

More specifically, it will be noted that the present invention **1** comprises a passive RFID transponder with a serial number **3** embedded within a golf ball **2**, a wireless and/or wired grid of transceivers **5** for transmitting and receiving electromagnetic signals to locate and read the serial number of the passive RFID transponder **3** embedded in the golf ball **2**, a computer server and/or database management system to maintain a database for tracking locations of the golf balls and the associated golf strokes, and a database of maps of the golf course, and a hand held personal data assistant (PDA) **6** to transmit and receive information on the location of the golf balls, golf strokes, location of the PDA **6**, maps of the golf course and golf scores of the golfers.

As shown in Figure 1, the embedded passive RFID transponder **3** will transmit its serial number when interrogated by the transceivers **5**. The passive RFID transponder is small, low mass and robust to withstand shocks that are common in a golf ball.

Figure 2 shows operating principles of a transceiver **4** and the passive RFID transponder **3**. The transceiver **4** transmits an electromagnetic signal with a power  $P_1$  to the transponder **3**. The

transponder 3 electromagnetically couples by resonance to the arriving signal and uses the energy of this arriving signal to do work. The arriving signal has a reduced power  $P_1^*$  due to attenuation and scattering. The transponder 3 transponds to the arriving signal and its power by transmitting its serial number with a further reduced power  $P_2^*$  back to the transceiver 4. The transponder signal arrives at the transmitter with a power  $P_2^{**}$ . Due to attenuation and scattering, the power  $P_2^{**}$  is further reduced, and hence the communication between the transceiver 4 and transponder 3 would have a range depending on transmitting power. The signal from the transponder 3 will be received by a minimum of two transceivers in the wireless and/or wired grid 5, and the location of the transponder and golf ball 2 would be calculated by triangulation. Since the location of the cup on the green is a known information from the computer server and/or database management system, the distance of the golf ball to the cup on the green can be calculated.

Figure 3 shows the wireless and/or wired network grid of transceivers 5 for conveying location and serial number of the golf ball 2 to a computer server, and for conveying information on the golf balls, golf strokes, golf scores, location and identity of the PDA 6 from the computer server to the PDA 6. A computational device (such as the said computer server, the data management system, or the PDA) calculates the distance from the golf ball to the PDA and also to the cup on the green from the transceiver grid map. It should be noted that the grid configuration shown in Figure 3 is for illustrative purposes only and other grid configurations can be implemented in the system.

Figure 4 shows the PDA 6 which is used to display selected information on the golf hole, such as the location and identity of the golfer, location and identity of the golf ball, number of strokes associated with the golf ball, location and identity of the hole and map of the hole. Furthermore, the PDA 6 could be used to display contour maps of the greens, golf scores of the golfers, and other golfer statistics.

With respect to the above description then, it is to be realized that the optimum dimensional relationships for the parts of the invention, to include variations in size, materials, shape, form, function and manner of operation, assembly and use, are deemed readily apparent and obvious to one skilled in the art, and all equivalent relationships to those illustrated in the drawings and described in the specification are intended to be encompassed by the present invention.